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AMMONIA FUMIGATION FOR COCCIDIAL DISINFECTION

C. HORTON-SMITH, E. L. TAYLOR AND E. E. TURTLE

Few disinfectants are known which are effective in the destruction of coccidial oöcysts (see publications of Johnson, 1923; Beach and Corl, 1925; Pérard, 1924; Chandler, 1932; Fish, 1932). Pérard points out that many disinfectants favour the development of oöcysts indirectly by destroying bacteria which are present and which normally inhibit the development or even destroy the oöcysts. Working with the oöcysts of rabbit coccidia Pérard found that they completed their development in 0·1 per cent. potassium permanganate, in 5 per cent. formalin, 5 per cent. phenol, 5 per cent. copper sulphate, and 1 to 10 per cent. sulphuric acid. The present writers have confirmed this work with the oöcysts of *Eimeria tenella* and find also that development is completed in 5 per cent. potassium hydroxide, and in 5 per cent. potassium iodide.

Following our enquiry into the efficiency of the blow-lamp for the destruction of coccidial oöcysts (Horton-Smith and Taylor, 1939) we proceeded to carry out a series of trials with various common disinfectant substances, and were led in the end to the recognition of the powerful action of ammonia.

In view of the possible advantages of fumigation over the application of liquid disinfectants in that a more widespread distribution of the substance might be expected to result, we tested the effect of ammonia gas, and finding it to exert a powerful action in preliminary laboratory tests we carried out a series of trials on a more extensive scale, a brief account of which is given here.

LIQUID AMMONIA AS A DISINFECTANT FOR COCCIDIA

A series of tests was first carried out to determine the lethal effects of different percentages by volume of 0·880 ammonia in distilled water. Mixtures of a suspension of unsporulated oöcysts in distilled water and ammonia were adjusted to give known strengths of 0·880 ammonia ranging from 0·5 per cent. to 4·0 per cent., the oöcysts being examined for sporulation at the end of three days. Results of these tests are shown in Table I.

In a second series of trials a suspension of unsporulated oöcysts was concentrated in tubes in the centrifuge, the supernatant fluid was poured off and 15 c.c. of a 10 per cent. solution of ammonia was added to each tube. At the end of various periods at room temperature the oöcysts were re-concentrated and washed at least three times in distilled water, or until no smell of ammonia could be detected, after which they were transferred to a bare covering of 2·5 per cent. solution of potassium bichromate in a petri dish for three days when they were examined for sporulation. Controls from the same suspension but not treated with ammonia were cultured by the same method. Results are shown in the following table :—

TABLE I

Showing the effect of various strengths of 0·880 NH_3 in water on the viability of non-sporulated oöcysts

Percentage of 0·880 Ammonia in water.	Percentage of sporulation among oöcysts at the end of three days.
0 (control)	88
0·5	12
1·0	0
1·5	0
2·0	0
2·5	0
3·0	0
3·5	0
4·0	0

TABLE II

Showing the effect of 10 per cent. liquid ammonia for various periods on the viability of non-sporulated oöcysts

Time treated.	Per cent. sporulation after culture. Averages based on readings from six tubes.
Control	54
15 mins.	19
30 „	3
45 „	0
75 „	0
120 „	0
240 „	0

In other tests it was found that a 1 per cent. ammonia solution killed all oöcysts in 24 hours, and 5 per cent. solution killed all oöcysts in two hours. Minimum lethal periods for these strengths, however, were not determined.

These results indicate the marked efficiency of liquid ammonia as a disinfectant for coccidial oöcysts.

An Observation on the Effect of the Hydrogen-ion Concentration

In another series of tests three strengths of ammonia solution were used. Unsporulated oöcysts were

suspended in 1 per cent., 5 per cent., and 10 per cent. solutions for one, two and three hour periods in each, the *p*H values of these solutions having previously been determined as 11·2, 11·5 and 11·6 respectively. The results after culture are shown in the table.

TABLE III

Showing the effect of various strengths of liquid ammonia of known p*H on the viability of non-sporulated oöcysts*

Time of exposure in hours.	Percentage sporulation of oöcysts after exposure to various strengths of ammonia solution.			
	1 per cent., *p*H 11·2.	5 per cent., *p*H 11·5.	10 per cent., *p*H 11·6.	Control.
	Per cent.	Per cent.		Per cent.
1	73	24	0	84
2	64	0	0	84
3	54	0	0	84

Unsporulated oöcysts suspended in a sodium hydroxide solution of a *p*H of 11·2 for three hours showed 70 per cent. sporulation after culture, suggesting that the *p*H is not the most important factor. As a further trial it was shown that oöcysts suspended in ammonium carbonate solution of *p*H 8·7 do not sporulate after five days and it seems probable, therefore, that the lethal action of ammonia is due to the toxicity of the ammonium ion rather than to any change in the hydrogen-ion concentration.

Laboratory Experiments with Ammonia Gas as a Disinfectant for Coccidia

Having ascertained in preliminary observations carried out in ordinary desiccators at room temperatures, that moderate dilutions of ammonia gas* are adequate for the destruction of coccidial oöcysts we invited the co-operation of the Imperial College Field Station at Slough and with the help of A. B. P. Page, whose advice and assistance we should like to acknowledge here, we carried out further laboratory tests and actual fumigations of poultry houses.

The laboratory work consisted of the setting up and calibration of the apparatus described by Page in 1932, by means of which a known concentration of ammonia could be obtained. The apparatus consisted of a vacuum desiccator of 11 litre capacity into which could be measured an ammonia solution of given specific gravity, the concentrations obtained in the air-space from specified additions of the solution being determined by means of samples drawn through lengths of capillary tubing into 200 c.c. evacuated flasks containing standard sulphuric acid. At the beginning of each experiment two samples of oöcyst-laden faeces, each weighing 2 grammes, were introduced into the desiccator and after the experiment was completed these were taken out again, and laid in the open for 24 hours before washing and culturing for 48 hours in a 2·5 per cent. potassium bichromate solution.

At the two highest concentrations used, approximately 25·0 and 30·5 mg. per litre, 30 minutes treatment of infected faeces was found sufficient to destroy the majority of oöcysts, and all were destroyed after a treatment for one hour. The results are shown in Table IV.

TABLE IV

Showing the lethal effect of ammonia gas on coccidial oöcysts in a desiccator

* Approximate gas concentration. Mg./litre.	Time treated in hours.	Development of treated oöcysts. Per cent. sporulation.	Control per cent. sporulation.
7·7	2	71	89
	3	0	
11·8	1	56	79
	2	75	90
	3	0	56
	4	0	84
16·4	1	41	71
	2	39	
	3	0	
18·3	2	5	90
	3	0	92
21·2	1	3	74
	2	5	77
	3	0	
25·0	1	0	83
	2	0	
30·5	0·5	2	64
	1	0	
	2	0	

* Ammonia solutions of specific gravities of 0·970 and 0·910 were used to obtain the required concentrations.

The approximate gas concentrations given by the addition of different quantities of ammonia as determined by previous calibration are shown in the following table :—

Ammonia sp. gr. 0·970.		Ammonia sp. gr. 0·910.	
c.c.	Concentration in mgs./litre.	c.c.	Concentration in mgs./litre.
2·0	7·7	1·6	25·0
3·0	11·8	2·0	30·5
4·0	14·2		
5·0	16·4		
6·0	18·0		
7·0	19·8		
8·0	21·2		
9·0	22·6		
10·0	24·0		

The effect of the presence of the faeces on the concentrations of ammonia gas was also demonstrated, the concentrations then being appreciably lower. These figures are set out in Table V.

* The mechanism by which the oöcysts are killed by the gas has not been demonstrated. Owing to the sensitivity of the oöcysts to dry conditions it was not found possible to determine the effect of the gas itself. The ammonia may dissolve in the faecal moisture and then permeate the oöcyst-wall.

TABLE V

Showing the concentrations of NH_3 attained in a desiccator in the presence and absence of faecal samples

Quantity of ammonia solution used (sp. gr. 0·970).	Concentrations of NH_3 in mgs./l present in desiccator 30 and 60 minutes after the introduction of ammonia solution of a sp. gr. 0·970.			
	In the absence of faeces.		In the presence of 4 grammes of faeces.	
	30 mins.	60 mins.	30 mins.	60 mins.
1·6 c.c.	8·0	9·4		
3·0 „	10·9	12·0	8·0	9·7
6·0 „	17·8	19·1		
10·0 „	22·5	25·0	17·4	17·8

FUMIGATION OF POULTRY HOUSES

Two houses of 700 cubic feet capacity, and similar in construction and situation, were used in these tests. The ammonia was delivered as a gas from a cylinder at the rate of 3 ozs. to every 10 cubic feet capacity of the house, and the resulting concentrations in various parts of the poultry house were determined by estimations on samples of the atmosphere collected in evacuated flasks. Oöcyst-laden faecal samples of 25 grammes weight were placed in various parts of one of the houses, in order to test the effect of the fumigation, some of the parts being those thought to be most inaccessible to the gas. In general, the highest concentrations of ammonia attained were found to be far below the theoretical values, and it was observed that they rapidly decreased, owing, presumably, to leakage and to the absorption of the ammonia by the fabric of the house.

Subsequent culture of the test faecal samples in this house showed the treatment to have been effective in all except the most inaccessible part, where viable oöcysts were still found to be present. This position refers to the wooden floor, 8 inches below some large moveable zinc trays that are placed on the superimposed wire floors for the accommodation of young chicks; this part would have been quite inaccessible to the chickens.

The other house used in these observations was known to be infected with coccidia before the fumigation was carried out and the effectiveness of the treatment was tested by the introduction of coccidia-free day-old chicks; these were found to remain coccidia-free for the three subsequent months during which they were kept in isolation in that house.

Further precautions were then taken to reduce leakage by suspending tarpaulin sheets in such a way as to cover the sides of the house and the greater part of the roof, infected faecal samples being introduced into the same positions as before in order to test for viable oöcysts at the completion of fumigation. With the exception of one sample beneath the pen-flooring in which the sporulation was 20 per cent., no oöcyst-development could be found, although control samples, kept in the laboratory, showed a 60 per cent. sporulation. The rate of reduction in the concentration of the gas was more rapid than had been expected, doubtless as a result of a strong wind which was blowing at the time of fumigation, but the figures given in Table VI show that the concentrations obtained when tarpaulins were used were higher and considerably better maintained.

TABLE VI

Concentrations of NH_3 reached at three sampling points in an uncovered house and in a house covered with tarpaulin sheets*

Time of sampling after completion of the entry of the ammonia.	Concentrations of NH_3 in mgs. per litre.					
	Uncovered house.			House covered with tarpaulin.		
	Sampling points.*			Sampling points.*		
	No. 1	No. 2	No. 3	No. 1	No. 2	No. 3
5 mins.	37·0	24·3	2·0	64·5	1·3	2·1
20 „	15·0	14·5	7·5	35·2	5·8	4·1
40 „	8·1	8·9	3·2	15·7	12·6	4·5
100 „	1·8	1·3	0·7	8·6	8·4	4·7
135 „	1·0	0·7	—	5·7	6·6	3·3
270 „	0·0	0·0	0·0	2·7	—	1·5

* *Situation of Sampling Points.*

No. 1. In open not far from point of entry of ammonia.
No. 2. In an open cupboard at opposite end of the house.
No. 3. Underneath a zinc tray that rests on wire netting, 8 inches above the wooden flooring of the pen.

Summary and Conclusions

1. Trials on the lethal action of liquid ammonia against coccidial oöcysts showed that a 1 per cent. solution of 0·880 ammonia kills 100 per cent. of oöcysts within 24 hours, a 5 per cent. solution within two hours, and a 10 per cent. solution within 45 minutes.

2. Sodium hydroxide solutions were found to be much less effective than ammonia solutions of the same *p*H, and it was concluded that the action of the ammonia is due to the toxicity of the ammonium ion rather than to any change in the hydrogen-ion concentration.

3. Ammonia gas used as a fumigant was also found to be lethal to coccidial oöcysts. A concentration of 25·0 mg. per litre was found to destroy 100 per cent. of oöcysts within one hour and a concentration of 7·7 mg. per litre to destroy 100 per cent. within three hours. The presence of faeces has a considerable effect in reducing the concentration of ammonia in the atmosphere, a reduction from 22·5 to 17·4 mg. per litre having been observed within half an hour in the presence of faeces.

4. Trials carried out on poultry houses showed that fumigation with ammonia gas works effectively under practical conditions. Gaseous ammonia used at the rate of 3 ozs., per 10 cubic feet capacity of the house resulted in the destruction of all accessible oöcysts within the house; the only samples to escape its action were those underneath a false floor.

5. Tarpaulin coverings to the poultry house are an effective means of reducing undue leakage during fumigation.

(*Continued at foot of col. i, page* 832.)

The Standardisation and Interpretation of the Agglutination Test for Brucella Infection in Cattle*

W. L. HINDMARSH, B.V.SC., M.R.C.V.S., D.V.H.
VETERINARY RESEARCH STATION, GLENFIELD, N.S.W.

The Secretary of Section L has asked me to lead the discussion on the subject of "What constitutes a reaction to the agglutination test for contagious abortion?" At first glance it might appear that a certain degree of agglutination and sedimentation of the bacteria constitutes a reaction, but in the diagnosis of infection the matter is by no means so simple. It appeared to me, therefore, that a general discussion of the development of the test and the various factors involved would be of some value.

Topley (1933) records that agglutination of bacteria was first described by Gruber and Durham in 1896. Grunbaum (1896), Widal (1896) and Widal and Sicard (1897) recognised the value of the test for the diagnosis of typhoid fever, but its use was soon extended to other diseases, though often with indifferent success (Arkwright, 1931). In addition to the testing of sera for the presence of agglutinins against bacteria suspected of having invaded the host, agglutination was utilised in the identification of unknown bacteria.

Specific agglutination is now regarded as occurring in two stages. In the first place the bacteria are acted upon by the agglutinin present in the serum of the infected or immune animals. This action confers on the bacteria the property of clumping in the presence of neutral salts in low concentration. In the second place the bacteria are agglutinated into clumps in the presence of electrolytes. The clumps then fall to the bottom of the tube by gravity.

Wright and Smith (1897) used the agglutination test for the differentiation of Malta and typhoid fever. Birt and Lamb (1899) described the agglutination test for Malta fever, basing their work on that done previously by Wright. These authors recognised the necessity for a standard method of preparing antigen, a knowledge of the agglutination titres of sera of normal and infected individuals and a knowledge of the period that elapsed between infection and the presence of agglutinins in the serum.

Since this work was published the agglutination test has come into general use in the diagnosis of infection of cattle with *Brucella abortus*.

McFadyean and Stockman (1912) concluded as a result of their tests that "one will be justified in regarding complete agglutination with a serum dilution of 1 in 50 or 1 in 100 as strong evidence of infection." They drew attention to the facts that all animals whose sera give a positive reaction do not necessarily abort and that certain infected animals which do abort may not give a positive reaction at or shortly after the event although later the serum will react positively. The standardisation of the bacterial suspension used in these tests was "when viewed in one of the small tubes employed for the tests, it was faintly hazy in appearance." The tubes were incubated at 37° C. to 38° C. for 24 hours before reading.

Seddon (1915) reported upon his investigations into use of the agglutination test. He emphasised the necessity for a standardised bacterial emulsion for use as antigen, using a suspension of barium sulphate* as a standard of opacity. In a later report Seddon (1919) drew attention to the fact that, whilst agglutination due to non-specific agglutinins would take place if sufficient serum was added to the bacterial suspension, the concentration of these agglutinins is never very high. With regard to the agglutinins developed as a result of invasion of the body by *Br. abortus*, he referred to the definite relationship between the quantity of specific agglutinins and of the bacterial suspension which go together to produce the agglutination reaction, pointing out the necessity for using a definite unit of the suspension in the test.

As a result of his investigations he concluded that agglutination with 0·01 ml. of serum, using the unit of antigen previously described, was evidence of infection (N.B.—0·5 ml. of suspension was used and the total volume of fluid in the tubes was 2 ml.). Seddon compared the agglutination responses with the clinical history of the cattle. Like McFadyean and Stockman, he noted that some infected animals failed to give a positive reaction until after abortion and that a small percentage of cattle, infected apparently in the uterus only, may have a decreasing agglutination titre and eventually give a negative reaction.

The agglutination tests carried out at the Glenfield Veterinary Research Station are based upon Seddon's work, agglutination with 0·01 ml. of serum being regarded as a positive reaction. For purposes of convenience, however, we standardise the antigen by comparison with tube 2 of Burroughs Wellcome standard opacity tubes. This gives a suspension slightly less dense than Seddon's Barium Standard.

The wide use of the agglutination test for the establishment of abortion-free herds has led to many thousands of tests being carried out in laboratories in almost all civilised countries. From the accounts of tests as applied in various centres, there is considerable variation in the technique adopted, and unless the exact details of the test are published it is difficult to make comparisons between the results obtained by different workers. Hence it is now generally admitted that there is necessity for the

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*Three ml. of 1 per cent. solution of barium chloride in distilled water was added to 97 ml. of 1 per cent. solution of sulphuric acid in water.

References

BEACH, J. R., and CORL, J. C. (1925.) Studies in the Control of Avian Coccidiosis. *Poultry Science.* **4.** 83-93.
CHANDLER, W. L. (1932.) On the Control of Caecal Coccidiosis in Chickens. *Mich. Agr. Exp. Sta. Tech. Bul.* 127. 1-24.
FISH, F. F. (1932.) Some Factors in the Control of Coccidiosis of Poultry. *J. Amer. vet. med. Ass.* N.S. **33.** 543-559.
HORTON-SMITH, C., and TAYLOR, E. L. (1939.) The Efficiency of the Blowlamp for the Destruction of Coccidial Oöcysts in Poultry Houses. *Vet. Rec.* **51.** 839-842.
JOHNSON, W. T. (1923.) Avian Coccidiosis. *Poultry Science.* **2.** 146-163.
PAGE, A. B. P. (1932.) The Measurement of Gaseous Concentrations for the Control of Fumigation. *J. Soc. Chem. Indust.* **51.** 369T.
PÉRARD, C. (1924.) Recherches sur la destruction des oocystes de Coccidiés. *C. R. Acad. Sci. Paris.* **179.** 1436-1438.

determination of a standard for the technique and interpretation of the test. In this connection Stableforh (1936) has published some interesting and pertinent data. He carried out tests on the sera of 50 cows, with the bacterial suspensions of different laboratories and using the technique and methods of reading adopted in these laboratories. The results were far from uniform.

19 cows reacted negative or doubtful.
24 „ „ negative or doubtful or positive.
2 „ „ doubtful or positive.
1 „ „ negative or positive.
4 „ only gave a positive reaction to all the methods used.

Thus 46 of the 50 cattle would have been judged positive, negative or doubtful according to the technique adopted.

Similarly in America sera have been examined simultaneously in a number of laboratories with reactions that varied to a considerable degree. When one considers the large number of institutions throughout the world in which the test for Bang's disease is carried out, the almost innumerable variations in technique and interpretation, and the fact that, in spite of these variations, herds are being rid of the infection, we can only marvel at the results being attained. However, it is undoubtedly true that the less exact methods lead to economic loss in causing the disposal of non-infected animals and in lengthening the period of eradication by the failure to select some infected cattle.

It is obvious that in deciding the significance of the results of the test we are not concerned merely with the highest or lowest dilution which gives agglutination; we have to take into consideration:—

(*a*) The suspension of bacilli.
(*b*) The blood serum.
(*c*) The diluting fluid.
(*d*) The treatment of the combination of serum and antigen.

Frei (1937) discussed these matters very fully and his opinions are freely quoted in the following summary.

Serum.—Coagulation can exercise an action on the colloids of the serum and notably on the agglutinins. Coagulation at low temperatures or shaking during coagulation must be avoided, otherwise the agglutination titre will be lowered. Tests should be put up as soon as possible after collection of the serum, since the titre may fall if the serum is held for lengthy periods, although delay of three or four days is not of much significance. How far the holding of uncontaminated sera is of importance is difficult to state, but the sera used as known positive controls at Glenfield have been for some months carbolised without any appreciable loss of titre in the diagnostic range. These sera are, however, strongly positive, and it can be understood that a slight loss of agglutinin may be of significance with sera on the border line; of course contamination of the sera, which frequently occurs in field collection and at high temperatures, exercises an adverse influence and renders some sera untestable. Similarly haemolysis and consequent staining of the serum is undesirable, and according to Frei may lessen the titre. In our experience haemolysis frequently leads to a deposit in the control tube not containing antigen and thus renders the interpretation of the test very difficult. Frei, quoting the report of the U.S.A. Commission on Bang's Disease, states that, whilst variations of *p*H within fairly wide limits (4·7 to 8·9) do not have any noticeable effect on the titre, unclean bottles, especially those which have held disinfectants such as cresol or soaps, tend to lower the titre.

Bacterial Suspension.—It is generally known that the agglutinability of the antigen is influenced by the method of culture and type of culture media employed. Stableforth showed that when using the same bacterial strain there was a difference in the agglutinability of suspensions prepared in the different media, prepared in similar media but using organs from different species of animals, and even in different flasks using the same medium. Hence it is well-nigh impossible to guarantee that supplies of media prepared under similar conditions will be identical. Such difficulties could be overcome if each batch of antigen could be titrated against a standard serum; the recent work in the preparation of standard dry serum offers hope in this direction.

Whilst many laboratories prepare their antigens from cultures when they have attained their apparent maximum growth, *e.g.*, after two or three days, Frei prefers to use 24-hour cultures, since, in his opinion, at this age of culture there is maximum agglutinability. Culture is sometimes raked off the medium with a glass rod or a platinum needle. In the U.S.A., however, the usual practice is to flood the flask or tube with carbol saline, and allow the fluid to remain in contact with the culture two or three hours before washing off. In any case the suspension must be filtered to remove any particles of agar, which, if left in the antigen, may increase the degree of agglutination.

The use of living bacteria in the suspension is favoured by some, but the consensus of opinion is against this practice on account of danger to the laboratory staff, and because the bacteria may be killed without any appreciable effect on agglutinability. In this connection Henry and Traum have stated that tricresol 0·2 per cent. and carbolic 0·5 per cent. have scarcely any effect on the results of the test, but that formalin is not desirable.

As previously mentioned the density of the suspension is very important. Various methods have been adopted in the fixation of a standard of density. Opacity standards, enumeration of bacilli, centrifugalisation, nephelometers and opacity meters have all been used. Probably the best method is by centrifugalisation, using Fitch's modification of Hopkins' vaccine tube. Whilst some writers have stated that within certain limits the density of the suspension is without influence on the results of the test, others, notably Fitch, Donham, Bishop and Boyd, are of opinion that the maximum titre of agglutination of sera containing a moderate quantity of agglutinin changes with the density of the antigen. Stableforth has shown that with an increase in the density of the antigen there was a diminution in the titre of the serum.

The agglutinability of strains of *Brucella* from different sources varies to a great degree. Traum and Henry tested the agglutinability of 22 strains of *Br. abortus* and found considerable variation. Frei states that many strains react with sera which give negative results with other strains. On this account most workers use a suspension made of a number of strains.

In putting up the test it is usual to use a series of serum dilutions, although in the routine testing of large numbers of sera the series is a small one. Some workers make their serial dilutions in normal saline or carbol-saline before adding the sera to the antigen. Others, notably in America, add undiluted serum direct to the antigen. Stableforth states that with the latter method higher titres are obtained. The actual volume of fluid in the tubes is of some importance, as agglutination is more rapid in the smaller volumes, although the final result is probably the same.

The tubes are usually incubated at from 37° C. to 40° C., although agglutination will take place at lower

temperatures. Frei agrees with the findings of the Commission on Contagious Abortion of U.S.A. (1932-33) that the tests should remain in the incubator 42 hours at least.

Reading the Test

On reading the test it is usual to refer to different degrees of agglutination, indicating the reaction by the sign +.

	Continental	Fitch, U.S.A
Complete sedimentation, supernatant clear	++++	+
Almost complete sedimentation, supernatant almost clear	+++	1
Much sedimentation, supernatant hazy	++	
Light sedimentation, supernatant cloudy	+	
No sedimentation	—	—

Interpretation of the Test

With regard to *Brucella* infection of cattle, we must bear in mind that:—

(*a*) Agglutinins may appear in the blood in from one to three months after infection, so that an animal may be recently infected and give a negative reaction.

(*b*) Agglutinins may persist in the blood for a long period, even if the infection be lost, so that all animals giving a positive reaction do not necessarily harbour the living organism.

(*c*) The intensity of the reaction does not necessarily indicate the virulence or degree of the infection.

(*d*) There is a relationship between continuous high titre and udder infection.

(*e*) The greatest percentage of abortions occur in animals with a high titre (Huddleson).

Willems (1937) suggests that an agglutination titre should be determined, and he recommends the calculation of a constant of agglutination. He takes as an index of agglutinability of the suspension that dilution of a standard positive serum which gives 50 per cent. of agglutination.

Calculating in this way he found that 50 per cent. agglutination was given in a serum dilution of 1 in 700 with the suspension used in his laboratory and with 1 in 400 with the suspension used by Stableforth.

The indices of agglutinability therefore were 700 for the Belgian suspension and 400 for the English suspension.

This index is a measure of the degree of sensitivity of the suspension.

Utilising this suspension with an index of agglutinability of 700, Willems regards as a positive reaction a 50 per cent. agglutination with a serum dilution of 1/50.

The constant of aggutination is calculated as 50/700 or 0·07142.

Willems found that the index of agglutinability of the English suspension was 400 and the titre indicating infection will be obtained by multiplying the index of agglutinability by the constant of agglutination $400 \times 0{\cdot}07142 = 28{\cdot}56$, or roughly 1/30.

Stableforth regarded a positive reaction as that of 25 per cent. agglutination with a serum dilution of 1/40.

With the standard serum and the English suspension 25 per cent. of agglutination was obtained with a serum dilution of 1/500.

The titre of infection, therefore, is $\frac{500 \times 28{\cdot}56}{400} =$ 1/35·7, which is very close to Stableforth's standard of 1/40.

Willems points out that this shows that the infection titre recognised by him is close to that adopted by Stableforth, but he stated that it is not possible to forecast the titre of a serum with mathematical precision.

He tested the method on 11 sera.

In 3 cases the titre was accurately forecast.
" 6 " " " " 10% in error.
" 5 " " " " less than 10% in error.
" 1 " " " " " " 20% " "
" 1 " " " " " " 50% " "

How far such a method would be found of value it is difficult to say, but Willems' own test, although limited, shows a considerable margin of error in his prediction.

It is obvious, however, that it is not possible to answer the question "What constitutes a reaction to the agglutination test" until we know: (1) the exact technique of the test; (2) the agglutinability of the suspension used.

So far each laboratory appears to have worked out its own system of technique and interpretation on an empirical basis, although in some cases the titre indicating infection has been arrived at by reference to the clinical history of infected animals and subsequent bacteriological examinations.

Having adopted a standard method of antigen preparation and technique of test and having determined the titre which is indicative of infection, we are still faced with the problem of those animals whose sera have a titre somewhat below the accepted diagnostic titre and yet above that which might be ascribed to non-specific agglutination. Donham and Fitch have investigated this matter. They point out that the agglutination titre or titres which are selected as a basis to differentiate between specific and non-specific agglutinins are arbitrary separations in a continuous scale of agglutination reactions extending from low to high dilutions of serum. They have been made after extensive studies and experience, but they are not infallible. These authors tested 303 sera from cattle in herds that did not contain any animals with positive agglutination titres, with dilutions of 1 in 10 to 1 in 25. Thirty-seven per cent. of these showed agglutination in a dilution of 1/25. The significance of their findings was that we cannot consider all agglutination reactions in low dilutions as evidence of Bang's disease, although it may be an indication of a rising titre in a recently infected animal. Donham and Fitch do not consider this latter possibility of much importance as it detects only a minor percentage of animals that should be regarded as suspicious. In America the titre indicating infection is regarded as 1-100. Taking Donham and Fitch's work, it appears that somewhere between the 1/25 dilution and the 1/100 dilution, agglutination which may or may not be the result of *Br. abortus* infection will occur. Since the fixation of the titre of infection is arbitrary, we have to recognise that some reactions must be regarded as suspicious because we are not justified in diagnosing them as positive or negative. Subsequent tests of sera of the animals from which such sera have been collected will indicate if the titre is rising and thus permit a definite diagnosis. Kitselman (1936) reviewed the after-history of 1,000 cows testing suspicious (1/50) to the Bang agglutination test. After five months 60·1 per cent. had become negative, 23·1 per cent. had become positive, and 16·8 per cent. remained unchanged. These cattle were in herds in which the percentage of infection at the initial test ranged from 10 to 17·9 per cent. Thus 82·2 per cent. of the suspicious reactors gave a definite negative or positive reading within five months of the doubtful test. There are, however, certain animals

of which the serum titre persists at the one level of suspicion. In our experience such animals are not infected, although a careful bacteriological examination of the animal after slaughter has only been possible in one or two cases.

In determining the possible danger of these animals most authorities are of the opinion that the interpretation of the agglutination results can only be made satisfactorily in the light of the disease status of the herd, the breeding history and the stage of gestation. Thus Donham and Fitch would prefer to accept as non-infected a cow showing a low agglutination titre from a herd with no positive reactors than a non-reactor from a diseased herd.

All that has been said so far refers to the macroscopic tube agglutination test as carried out in the laboratory.

Attention is drawn to the rapid tests which have been evolved in other countries, particularly America. The rapid plate agglutination test is being used in at least one State in the eradication of *Brucella* infection of cattle, and in other States it is playing some part in the control schemes. It is claimed that with this test quantities of serum approximately equal to those used in the tube test are employed and that the results are very reliable. Of course, if this test were adopted a standard antigen should be available to all veterinarians using it, and a standard of technique and interpretation would be required.

Conclusions

There is no generally accepted standard for the performance and interpretation of the agglutination test for the diagnosis of *Brucella* infection of cattle.

Some attempts have been made to evolve a method of standardisation of this test.

A standard of preparation of the bacterial suspension should be adopted in Australia, and the agglutinability of each batch be tested against a standard positive serum.

The standard positive serum can be maintained at approximately its original titre for some years in a dry condition.

It would be an advantage if the standard suspension to be used throughout Australia could be prepared in one central laboratory.

A standard technique should be adopted throughout Australia so that the tests carried out in different laboratories will be comparable.

Consideration should be given to the adoption of the rapid methods of agglutination testing since these would be of value to the field officer in the initial determination of the approximate degree of infection in a herd. It may be possible to adopt this method as the standard test as has been done in parts of America.

References

Topley, W. W. C. (1933.) "An Outline of Immunity," p. 68. Edward Arnold & Co., London.

Grunbaum, A. S. (1896.) *Lancet, London.* **11.** 806. (Quoted by Arkwright.)

Widal, F. (1896.) *Bull. Soc. méd. Hôp. Paris.* **35.** 13. (Quoted by Arkwright.)

———, and Sicard, M.A. (1897.) *Ann. Inst. Pasteur, Paris.* **11.** 353. (Quoted by Arkwright.)

Arkwright, J. A. (1931.) "A System of Bacteriology in Relation to Medicine." **6.** 381. Medical Res. Council, England.

Wright, A., and Smith, F. (1897.) "Studies on Immunisation." A. E. Wright, Archibald, Constable & Co., London, 1909, 3. Reprinted from *Lancet*, London, 1897.

Birt, C., and Lamb, G. (1899.) *Ibid.* Reprinted from *Lancet*, London, 1899.

McFadyean, J., and Stockman, S. (1912.) *J. comp. Path.* **25.** 22.

Seddon, H. R. (1915.) *Ibid.* **28.** 20.

———. (1919.) *Ibid.* **32.** 1.

Stableforth, A. W. (1936.) *Ibid.* **49.** 251.

Frei. (1937.) *Bull. Off. intern. Epizoot.* **14.** 20.

Willems, R. (1937.) *Ibid.* **14.** 62.

Donham, C. R., and Fitch, C. P. (1936.) *J. Amer. vet. med. Ass.* **89.** 176.

Kitselman, C. H. (1936.) *Ibid.* 678.

CLINICAL COMMUNICATION

"Dislocation" of the Neck in Cattle*

T. Y. RANSON, M.R.C.V.S.

Dungannon, Co. Tyrone

In August, 1939, a message was received to visit three yearling heifers that were described by the owner as having swellings on their necks. On arrival at the farm one heifer was found dead; the others were in a field and were noticed to be holding their heads to one side.

Symptoms.—On examination both animals were found to have a unilateral "dislocation" of the neck. When the head was extended the vertebrae returned to the normal position and remained there while the head was rotated to the opposite side. When the head was released it returned to the other side and the vertebrae could be felt slipping out of articulation. The heifers were in very poor condition and were literally covered with ticks, these being attached to the sides and back in addition to the usual sites, and the male ticks were seen creeping in the hairs. There was continuous movement of the heads to lick their tick-covered bodies and repel the flies, and it seemed a reasonable diagnosis that the "dislocation" was due to repeated bending of the neck. The normal muscular support to the vertebrae was decreased in these emaciated animals and more strain was put on the intervertebral ligaments, causing them to rupture.

Treatment.—The heifers were removed to a loose-box and given a nourishing diet. It was not considered advisable to drench them and a haematinic tonic was prescribed which was taken in a mash. A derris root wash was supplied to kill the ticks. Difficulty was experienced in applying an effective support to the necks, but this was furnished in the form of padding round the neck and a wooden cradle. A week later there appeared to be an improvement in the condition of the animals but the vertebrae did not remain in the normal position and they both died.

Remarks.—The grazing field was of very inferior grass with patches of rushes and furze and there was a carpet of moss which provided ideal cover for the ticks.

In August, 1938, a heifer on another farm was found in a similar condition to the heifers described above. It was diagnosed as accidental "dislocation" of the neck, and if isolated cases only had been met they would probably have been put down to accident. When the only three animals occupying a field have been found with "dislocated" necks it appears to exclude accidental occurrence.

* Case reported to the North of Ireland V.M.A. at Belfast, September 6th, 1940.

Discussion

In the discussion which followed Mr. Hart said he had seen a rather similar condition in cattle which had been driven on a rope for a long distance. He thought that it was a straining of the muscles which produced the condition, from which the animals always recovered eventually.

Mr. Williamson reported seeing an actual dislocation of the neck in a horse. To get the animal to rise the neck had to be put straight and the animal could only be turned in one way, else dislocation again occurred and the animal collapsed. This horse was slaughtered.

Mr. Kelly said that he had seen similar cases to those reported where there was extreme emaciation. He was of the opinion that it was not a true dislocation but a muscular weakness with unilateral paralysis of the neck.

Mr. Kernohan thanked the author for the interesting observations and said that during his long period in practice he had never come across any similar cases.

Mr. Ransom, in reply, said he had seen several cases of true dislocation of the neck followed by paralysis. In the cases under discussion he saw them only once and no paralysis was then present. The owners had been asked to let him know if the animals did not improve and he was rather surprised when some time later he was informed that they had died. An opportunity to carry out a *post-mortem* examination was thus not provided.

MEDICINAL HERB CULTIVATION: AN ESSENTIAL INDUSTRY

"Great Britain cannot now replenish her stocks of many of the vegetable drugs, and so the immediate problem is how to find the drugs whose importation is now denied us. The scarcity of some of them is acute and, so long as the war lasts, the chief means of replacing stocks will be by home cultivation and collection," states the *Pharmaceutical Journal*, which proceeds: "Some of the most needed drugs grow wild in the British Isles and run to waste for want of collection. Many others can be cultivated in sufficient quantity to satisfy all our domestic wants, and any amateur gardener, producing medicinal plants in his own garden, will find a ready market at high prices for every pound of material he can offer, provided it is properly dried and of fair marketable quality. Vegetable drugs were imported at such low prices from Continental countries where labour is so very cheap, that English farmers were discouraged from extending their production. In the past, English cultivators, because of resistless competition from Europe, have avoided many of the raw materials of medicines which are now so much wanted. Existing herb farms are being extended but almost equally important is the part which amateur gardeners might play in the campaign to make Great Britain self-sufficient so far as its needs of many of the vegetable drugs are concerned especially if they are linked up with professional growers who could dry the plants and prepare them for the drug market." Stating that just as in August, 1914, it was discovered how dependent this country had become upon Germany for a wide range of medicinal chemicals, so now, with the outlets closed of a large portion of Europe we are confronted with the problem of replenishing our stocks of raw materials from which medicines are made, the *Journal* concludes with a plea for Government protection for this essential industry when the produce of all Europe becomes more available.

* * * * *

The British Medical Journal warns its readers that the Import Licensing Department of the Board of Trade does not propose to allow the importation of steel files for opening ampoules, nor to assist manufacturers of these files in the supply of steel. The suggestion is made that doctors should preserve any files they have and to use each one for as many ampoules as possible. The cardboard file with a cutting edge, of U.K. manufacture, is regarded as an adequate substitute for the steel file.

ABSTRACTS

[**GRASS SICKNESS IN HORSES.** Guthrie, W. J. (1940.) *J. R. Agric. Soc., Eng.* **100**. 50-59.]

A useful and comprehensive review of the disease known as grass sickness or grass disease of horses peculiar to certain parts of Scotland, England and Wales. This disease has come into prominence during the past few years, partly because of the severity of the losses and partly because, despite intensive research, its cause and origin still remain a mystery. Enquiries among older veterinarians have definitely shown that it is not a new ailment; the facts are that cases are now more frequently recognised for what they are, and that there has been a gradual increase in their number within the past 15 years. The disease is usually recognised as a clinical entity, but occasionally cases are met with which cannot be distinguished clinically from some form of bowel impaction. It may yet be found that there is some relationship between all types of bowel stasis, *e.g.*, there may be some common factor, possibly biochemical. In certain cases, it seems to the writer, the distinction between grass sickness and certain types of bowel "obstruction" is an artificial one. A particular case might in one area be called grass sickness, and an identical one in another district might be regarded as a type of impaction colic.

The history and incidence of the disease in England and Wales are described in some detail. It would appear that losses from the disease were first reported in 1907, around Barry Camp in Angus, but some Scottish veterinary practitioners say that they had seen occasional cases long before that date but that these had been diagnosed as obstinate cases of impaction of the large bowel. Definite cases were recorded from Northumberland and the North Riding of Yorkshire about 30 years ago, and from Kent in 1915. No case has been recorded in Ireland but it has been reported from Brittany, the plains of Hungary and in Colorado, while certain losses of horses on the pampas of South America are probably due to the same disease.

The horse only is affected; there is no record of cases in asses or mules. The disease is not hereditary, and all breeds are equally susceptible. Most cases occur in fairly young animals, with the highest incidence among the four-year-olds, although all ages over one year old are susceptible. By far the highest incidence is among farm animals, though cases do occur in towns and industrial areas. Most cases occur in horses with access to growing grass but the disease is occasionally seen in stall-fed animals fed on cut grass and even among others receiving no grass at all. The disease chiefly manifests itself fairly soon after horses have been turned out to pasture, the great majority in June (60 to 70 per cent.) with the peak period at the early part of that month. In Scotland it was severe in 1936, the losses being estimated at £50,000 to £60,000. In the worst affected areas of England and Wales the incidence is only about one-twentieth of 1 per cent. of the total horse population. Most cases occur in warm, dry, fine weather, and cold and wet cut down the disease temporarily. Early morning frost seems to cause an increase. A spell of warm weather following rain often produces numbers and it is suggested that some toxic factor may be present in the actively growing young grass, although, in spite of much research, the cause of grass sickness is still unknown.

Many theories have been advanced. Poisonous plants or fungi have been incriminated but there is no evidence that any of them or any cumulative poison in pasture grass is responsible. No protozoan or biting vector has been found to play any part, and heavy worm infestation does not appear to contribute. There is no scientific proof that toxins similar to that causing botulism are the cause and no causative virus has been found. " Intoxication " from the alimentary tract does not explain the local distribution of the disease, and no mineral or vitamin deficiency has been shown to be related to the disease.

No definite incubation period can be stated. At present diagnosis in the living animal is based solely on clinical signs. Thus it happens that acute cases have sometimes been diagnosed as " acute impaction of the bowel," " grass colic," " grass stoppage " " subacute obstruction," " grass impaction of the large bowel." In *peracute* cases death may occur within 24 hours. In some cases violent colic and much distress are shown, in others the animal is drowsy with only occasional abdominal uneasiness. Some degree of jaundice is, in the opinion of the author, nearly a constant symptom. Profuse sweating, abdominal tympany, salivation and regurgitation are noted. The animal crouches and may squeal in an attempt to vomit, and a sour fluid may run down the nostril. Swallowing is impossible, bowel movement is absent, the pulse weakens gradually and the horse soon dies. In an *acute* case—one which will probably be dead within four days—the symptoms appear to be much the same, but usually there is no acute colic pain, only discomfort throughout the whole course. In some cases, few or no symptoms other than an increased pulse rate may be seen at certain periods. *Subacute* and *chronic*, and very mild cases are described. Subacute cases may be regarded as those that die within three weeks and chronic cases those living longer, sometimes lingering for months. It appears difficult to differentiate between grass sickness and other conditions causing paralysis of some of the muscular part of the bowel, or such conditions as simple impaction of the large intestine, impaction of the terminal part of the ileum, colic due to worm infestation of the bowel, or ragwort (*Senecio jacoboea*) poisoning.

On *post-mortem* examination the stomach is found to be distended with enormous amounts of fluid apparently due to excess stimulation of the glands of the stomach wall. The large bowel is impacted with large masses of hard, dry faeces, but in peracute cases this may be limited or absent. The mucous membranes show irregular patches of congestion and the heart, liver and kidneys toxic changes. From pathological examination " it is evident that the disease is an ' intoxication ' or toxaemia of the system from absorption of some poison through the bowel wall, damaging chiefly the liver, heart and kidneys." A natural attack gives no immunity ; no treatment has been found to be of specific value and no method of prevention has been proved entirely successful.

L. E. W. B.

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[EFFECT OF CASTRATION ON BODY WEIGHT AND LENGTH. Rubinstein, H. S., Abarbanel, A. R., Kurland. (1939.) *Proc. Soc. Exp. Med. Biol.* **40.** 408-409. (4 refs.).]

Sixteen male albino rats were castrated when 22 days old. Sixteen uncastrated rats served as controls. All were maintained under similar conditions. The initial body weight was 38·44 ± 0·91 g. for the castrates, and 36·00 ± 1·43 g. for the normals. All animals were destroyed when 80 days old. The final mean body weight of the castrates was 192·0 ± 3·85 g., compared with 217·88 ± 3·40 g. for the normals. The difference of 25·88 ± 5·09 g. is mathematically significant. In addition the final body length of castrates was 194·1 ± 1·3 mm., and of normals 205·0 ± 1·2 mm. The difference of 10·9 ± 1·8 mm. is again statistically significant. Although there is thus evidence of suppression of somatic growth as determined by body weight and body length, the two factors do not appear to be relative. Body length is influenced more than body weight. At 80 days old the castrated rat is relatively heavy for its smaller body length.

D. D. O.

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[EFFECT OF A PELLAGRA-PRODUCING DIET ON HERBIVORA. Pearson, P. B., Schmidt, H., Mackey, A. K. (1939.) *Proc. Soc. Exp. Med. Biol.* **40.** 423-425. (1 fig., 7 refs.).].

Recent observations have confirmed the findings of numerous workers that nicotinic acid is effective in the prevention and cure of pellagra in humans, and black tongue in dogs, and is an essential constituent of the diet of pigs. Information is lacking, however, on the requirements of Herbivora. Experiments were therefore instituted using sheep as the test animals. Six lambs, two to three months old, were maintained on a nicotinic acid-free diet. All remained healthy over a period of 130 days. During the next 90 days one lamb failed to increase its body weight in proportion to the others which continued to thrive. The lamb, however, showed no vitamin deficiency symptoms. At the end of the experiment there was no significant difference in the weight of the experimental lambs and that of the controls. It is concluded, therefore, that nicotinic acid is either not a dietary essential for sheep or that its requirements are much lower than for the pig, dog, or human.

D. D. O.

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[SECONDARY TENDON CHANGES IN CHRONIC NAVICULAR DISEASE. Bresser, Dr. (1940.) *Deuts. tierärztl. Wschr.* **48.** 1-6. (Num. refs.).].

The changes in the navicular bone and its immediate surroundings which are associated with chronic navicular disease, may affect the mechanical workings of both flexor tendons. The result is a complicating tendinitis. It usually occurs as a peritendinitis only (presumably affecting the actual sheath of the tendon) but may cause tearing of tendon fibres and increased fluids, synovia and lymph, in the heel and fetlock area. These acute symptoms appear following fatigue or any other factor that changes the weight-bearing capabilities of the limb. It is possible that acute navicular disease may supervene. Ten cases are quoted giving evidence of this relation between tendinitis and navicular disease. [The author recommends that diagnosis be assisted by anaesthetising the plantar nerves, but it is not altogether clear how this would help to differentiate between lameness due to inflamed tendons and lameness due to navicular disease proper. Most of the symptoms described in this article seem to be the normal sequelae of chronic navicular disease.]

C. W. O.

REPORT

INDIA

Annual Report of the Veterinary Department of the Central Provinces and Berar (1939)

General.—The most important developments during the year were the establishment of quarantine stations for the control of rinderpest on a section of the northern border, and the opening of cattle and sheep breeding farms for the systematic improvement of livestock.

The establishment under the Cattle Diseases Act of 1934 of nine quarantine stations at suitable points on the most exposed section of the northern border is a further development of an attempt at systematic control of rinderpest by vaccination, which has become possible through the success of the goat virus vaccine which for years past has been extensively used in this province. During recent years a living vaccine derived from goats infected with a goat virus of fixed virulence, obtained originally from the Muktesar Research Institute, has been tested on a large scale in this province, and appears to have become popular.

The main danger of infection is from the cattle of dealers, who every year buy in the breeding districts of the north and north-west and pass by easy stages through central India to Bengal and the south-east, buying and selling from village to village and fair to fair as they go. These dealers follow well-established routes and that the traffic is a very big one may be judged from the fact that during the four months up to March, 1939, 41,499 cattle were passed through the nine quarantine stations which control only a small section of the frontier. The great danger of this constant movement of cattle from the point of view of disease control is obvious, and the intention in establishing these quarantine stations is to detain and vaccinate all cattle before entering into the province. The nine stations so far established are only sufficient to control a small section of the frontier, but this section is the one through which the main stream of dealers' cattle passes year after year, and this attempt to control rinderpest by systematic inoculation of dealers' cattle is one which will be watched with considerable interest in other parts of India. If successful, there should be considerable scope for its extension, but a factor which has always to be borne in mind is that in provinces and states where this movement of potentially infected cattle is not so common, the indigenous cattle are likely to be more highly susceptible to rinderpest than in provinces where they are constantly exposed to infection. For the immunisation of such cattle, and more particularly buffaloes, a live goat virus vaccine may prove dangerous, and this is a factor which must be taken into account in formulating any policy of active immunisation for the control of rinderpest, even in India, where the great majority of plains cattle are relatively highly immune.

The establishment of further farms for the improvement of livestock is a development of systematic animal husbandry which if properly maintained and carried on indefinitely should be of great benefit to stock-owners of the province. Too often in the past attempts of this kind have been abandoned as a measure of economy or because interest in the work has been allowed to wane before any lasting benefit could be obtained.

Disease Control.—During the year under review, rinderpest continued to be a serious cause of loss to cattle owners. The number of outbreaks was somewhat reduced, from 1,545 to 1,374, during the year, but the mortality was still high, namely, 8,057. It is stated that the decrease in the number of outbreaks is attributable to goat virus vaccination, and that this method of immunisation is proving popular and effective.

Inoculation with virus alone was used in 1,088 villages, while the sero-virus method was employed in 16 villages only. During the year there was a considerable falling off in the number of vaccinations with goat virus, but this is attributed to the fact that the special grant which was made by the Imperial Council of Agricultural Research for an extensive field trial of this system of control had expired. *Haemorrhagic Septicaemia* was very prevalent during the year, with an increase of outbreaks from 1,433 to 1,533 and a mortality of 7,163 as compared with 6,518 in the previous year. The vaccine alone method of control was far more extensively employed than either the serum alone or the serum simultaneous method. It is stated that recent experience has shown that the immunity conferred by vaccination is of two and a half months' duration only. Consequently the policy now pursued is to carry out inoculation immediately before the commencement of the monsoon. *Foot-and-Mouth Disease* was very prevalent during the year, with 6,335 reported outbreaks, but the mortality was less than during the previous year.

The incidence of and mortality from *Blackquarter* was considerably less than in the previous year, with 500 outbreaks against 1,154 and a death roll of 1,917 against 4,631. It is stated that the reduction in mortality is mainly due to active immunisation carried out before the onset of the rains in villages where the disease tends to recur every season. The inoculations performed were 52,563 vaccinations; 2,860 serum alone; and 460 serum plus vaccine.

Anthrax.—There was an increase in the reported outbreaks of this disease from 62 to 136 and in mortality from 364 to 739. During the year 15,117 animals were protected with serum alone or anthrax spore vaccine as compared with 4,579 protected by serum alone during the previous year. Anthrax spore vaccine had not previously been tried and is likely to be more extensively used in the future.

Bovine trypanosomiasis.—Sixty-four outbreaks of this disease were brought to notice against 25 during the previous year, and 131 cattle died. Fifty cases confirmed microscopically were treated with naganol or tartar emetic with satisfactory results.

Four hundred and forty cases of piroplasmosis in cattle, 92 cases of *Theileria mutans* and 39 of coccidiosis in bovines were confirmed microscopically. A few cases of nasal schistosomiasis were detected and treated with tartar emetic, while cases of rhinosporidiosis were treated with antimosan.

During the year 128 cows and four goats at the Government cattle breeding farms were tested for tuberculosis by the double intradermal method and seven cows and one goat gave positive reactions. One case of Johne's disease was reported during the year.

Surra.—Fifty-six outbreaks of this disease were reported with a mortality of 93. The presence of trypanosomes was confirmed microscopically in 116

cases. There were treated with naganol (Bayer 205) with good results.

Among dogs piroplasmosis (*P. canis*) was detected in 39 cases and *P. gibsoni* in ten. In this connection it is of interest that Capran is stated to have given very encouraging results in the treatment of *P. canis* infection.

Poultry Diseases.—Fowl cholera was confirmed in 77 birds and spirochaetosis in 20. Outbreaks of fowl cholera were controlled by protective inoculation with serum, vaccine or simultaneous injections of serum and vaccine. One outbreak of fowl-pox was detected and successfully controlled with vaccine obtained from the Muktesar Research Institute.

Breeding Operations.—There are now four cattle breeding farms for the breeding of improved cattle and buffaloes in the province, and a scheme for the utilisation of an extensive forest area in the Saugor district was approved and put into operation during the year. Some progress has also been made in the development of the milking herd of Sahiwal cattle, but it is stated that there is still a lack of interest in cattle breeding in the province. This is a factor which has militated seriously against the improvement of cattle in most of the more humid rice-growing tracts of the south and south-east, and is only likely to be overcome by the production of fodder crops, preferably of a leguminous nature, as alternative crops, rather than constant cropping with rice.

Two new dispensaries and six outlying dispensaries were opened during the period under review, and more were proposed but were held up for want of funds.

As mentioned above, nine quarantine stations were established on the northern frontier and 41,499 cattle passed through them during the four months that they were open. Of these, 41,315 were vaccinated against rinderpest and 47 cases of the disease were detected. A small number of cattle were allowed to pass on the strength of vaccination certificates issued at the point of origin. In addition, temporary special staff employed to check herds on the roads vaccinated 560 animals. In all, over 2,000 permits were issued under the Act, and it is of interest that the very small vaccination fee was sufficient to cover the whole expense of the quarantine stations. It is anticipated that considerable economic benefit will be derived by the province from control of infection at the border, and in view of the fact that the immunity conferred by this system of vaccination has been proved to be a lasting one of some years' duration, the value of vaccinated cattle should be considerably enhanced.

Systematic investigation of disease was continued under the grant for an Investigation Officer made by the Imperial Council of Agricultural Research, and a map is appended at the end of the Report, indicating the distribution of disease in various parts of the province.

A. O.

To keep in touch with all the war-time Government regulations becomes more difficult and expensive. Just over a year ago the Stationery Office issued the text of the regulations under 1939 Emergency Powers Act. It was a volume of 115 pages, costing 2s. The sixth edition of the same work is now published. It is just over twice the size of the first, and the price has gone up to 5s. Even a close study of this book will not ensure that one knows the law of the land. Most Ministers have made orders under the regulations. At intervals the Stationery Office issues a list of these at 6d. per copy.—*Daily Telegraph.*

NOTES AND NEWS

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Dec. 5th.—Annual Meeting of Dumfries and Galloway Division, N.V.M.A., at Dumfries, 12 noon.

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PERSONAL

Mr. R. Glave Saunders Re-elected Mayor of Exeter

The representative citizens of Exeter, at the Guildhall on Saturday, November 9th, accorded Mr. R. Glave Saunders, M.R.C.V.S., a notable tribute of confidence and esteem by appointing him to a third consecutive term of office as Mayor.

Alderman C. Warren, proposing the Mayor's re-election, spoke of the great work he and the Mayoress had done. On his proposition the City Council decided to record in the minutes heartiest appreciation of the services of the Mayor and Mayoress, their "untiring energy" and "the dignity with which they have upheld the office."

. . . . .

After a period of duty at the Ministry of Agriculture and Fisheries' Veterinary Laboratory at New Haw, Weybridge, Mr. F. T. Boyle, M.R.C.V.S., has been transferred back to the Ministry's field staff.

. . . . .

Marriage.—Twizell—Raitt.—At Rosehall Church, Edinburgh, the wedding took place on Saturday, November 16th, of Mr. Cecil William Twizell, M.R.C.V.S., son of Mr. and Mrs. William Twizell, of 5, Rothbury Terrace, Heaton, Newcastle, and Miss Elizabeth Russell Raitt, daughter of Mr. and Mrs. Alexander Raitt, of Marchall Place, Edinburgh. The best man was Mr. Eric Twizell, of Cockle Park, Morpeth, brother of the bridegroom.

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LEGAL NOTES

Foot-and-Mouth Disease Outbreak Sequel

At Builth Wells the Petty Sessional Court heard cases in which two farmers were summoned for offences under the Foot-and-Mouth Disease Order, 1928, in connection with the recent outbreak in the Parish of Llanwrthwl—when it was stated that it was 68 years since an outbreak of the disease had occurred in that district or anywhere near it.

Evan Davies, Rhiwnant Farm, Llanwrthwl, had to answer four charges: (1) Not giving notice with all practical speed of the outbreak of foot-and-mouth disease; (2) not causing swill to be boiled before feeding it to animals; (3) not keeping a record of the movement of three calves from his farm; and (4) failing to give facilities for an inquiry under the Foot-and-Mouth Disease Order.

David Thomas, Llwyncwtta, was also charged with failing to keep a record of the movement of three calves, and (2) failing to give facilities for an inquiry.

A plea of "Guilty" was entered in regard to the third charge against Davies, and the first charge against Thomas.

Police evidence in the first charge against Davies showed that on September 30th this defendant and Mr. Thomas, Doliago, came to the Police Station, and defendant reported to witness that he thought he had foot-and-mouth disease in pigs, a bull and two cows at his farm. He said the pigs were bad first, then the bull, and that day he had noticed the cows.

Mr. Archibald Houston, M.R.C.V.S. (Divisional Inspector under the Ministry of Agriculture), said that he visited Rhiwnant and examined two pigs, one bull and two cows, all of which were infected with foot-and-mouth disease. The sow had been infected for at least five days and the

other animals for the lesser stages down to a day.. One of the cows was only just affected.

The Chairman asked what were the symptoms and if they could be caused by any other disease, to which witness replied there would not be the same kind of blisters. He added that the period of incubation was 4 to 14 days.

Defendant, in evidence, said that on September 26th he noticed the sow was lame. He thought she had slipped and hurt herself, but the next day she seemed better. On the 28th his sister said the pig was off its food a bit, and he thought it had a chill. The next morning he noticed the bull was stiff, and thought he must have slipped on the hill. On September 30th he noticed a cow rather stiff and dribbling at the mouth, and the bull was the same, so after dinner he went to fetch Mr. Thomas (Doliago), whom he always called in when any of his animals were ill, the nearest veterinary surgeon being some distance away. When the cows came in from milking, another cow was just the same as the others. Mr. Thomas arrived about 6 p.m., and witness showed him the animals. He said witness was unlucky, and he thought it was "foot-and-mouth," although he had never seen it. Witness was surprised and worried, as he had had no suspicion. He knew nothing of the disease, and thought it was lameness or a chill. Mr. Thomas was not at the farm more than ten minutes, as they went straight to Rhayader Police Station. Witness had never seen any notices posted up in his district until then.

Replying to the Chairman, Davies said it was not until the Monday morning that he noticed the animals dribbling.

Ed. E. Thomas, Doliago, Llanwrthwl (farmer), said that from what he was told of the symptoms he suspected "foot-and-mouth," and purchased disinfectant at Rhayader and disinfected himself before going to Rhiwnant. Mr. Thomas said he did not think Davies had any suspicions that the animals had that disease. He had not noticed any posters posted in their district until now.

After a short retirement, the Chairman announced the Court had no hesitation in finding Davies "Not guilty" of the charge.

The magistrates next heard the charge against Dd. Thomas of failing to keep a record of the movement of three calves, and, as stated, defendant pleaded "Guilty."

In a statement defendant admitted saying that the calves came from Llanerchcawr, because he felt that if they went on all right no more would be heard about it, but if "they" knew the animals came from Rhiwnant, they would kill off all his stock. He had told the police everything he could to help.

Mr. A. D. J. Brennan, M.R.C.V.S. (Supt. Inspector under the Ministry of Agriculture), said Thomas eventually admitted to him also that the calves had come from Rhiwnant. Witness added that in his opinion, if it had been reported at the start, the three calves could have been killed and the other stock would not have been infected. Defendant kept them isolated, in so far as he knew about isolation.

Inspector Houston said that when they went to Rhiwnant, Davies said he had not brought any stock on to his farm since July, and the last entry was 60 ewes to Rhayader on September 27th.

Davies was next charged with failing to cause swill to be boiled and pleaded "Not Guilty." The Bench, however, found the charge proved.

The last charge, of not giving reasonable facilities, was next taken against Davies. It was stated that there was no doubt he had been advised to close his mouth about the movements of the calves. Apart from this he had been helpful and had always behaved as a truthful man.

Dr. Wilsdon, Divisional Inspector under the Ministry of Agriculture and Fisheries, gave evidence that Davies rendered all possible assistance in the slaughtering of the animals and he appreciated his help.

The Bench were of opinion that if a person failed to answer the whole truth to questions put to him for the purpose of gaining information, he was not giving all the facilities necessary for that inquiry.

Mr. E. L. Jones (defending) then pleaded "Guilty" in respect of the charges against Davies and Thomas. He said the men regretted the information was not disclosed.

Giving the magistrates' decision, the Chairman said the charges were of an exceedingly serious nature, and whatever sympathy the Bench might feel with the defendants, it was impossible to treat the matter lightly. The police had given very great assistance and had taken an immense amount of trouble in ascertaining the facts, and he would like it put up to the higher authorities that they had carried out their inquiry in a very capable way. The fines imposed on Davies would be £4 for not causing swill to be boiled; £1 for failing to keep a record; and £5 for failing to give reasonable facilities, making a total of £10. Thomas would be fined £1 for failing to keep a record and £6 for failing to give facilities, because the Bench felt there was a slight difference between the conduct of the two defendants. In addition the costs allowed would be £12 (£6 for the Ministry witnesses, £5 special advocate's fee and £1 court costs), which would be apportioned thus: Davies £7 4s. 0d. and Thomas £4 16s 0d. Davies thus had to pay £17 4s. 0d. and Thomas £11 16s. 0d.

* * * * *

Offence Against the Veterinary Surgeons Act

At Loughborough, on November 20th, Cuthbert J. Jeosmans, late of Park Lane, Castle Donington, was fined £20 and 3 guineas costs for an offence under the Veterinary Surgeons Act of 1881.

Mr. H. W. Timms, prosecuting for the Royal College of Veterinary Surgeons, presented a copy of the register of members, which did not bear the name of the defendant. The prosecution arose when the defendant applied for a firearms certificate, and it was discovered that he styled himself as the Veterinary Medical Research Co. of Great Britain, with laboratories at Littleover, near Derby. In a letter he sent to a member of the college he claimed to be a specialist in dairy cattle and sheep.

P.c. German said the defendant, in making an application for the licence, said he had to deal with mad animals.

After the case had been heard in his absence the defendant arrived, and on being informed of the magistrates' decision, asked for leave to appeal. This was granted, and he was allowed 21 days in which to pay the fine.—*Nottingham Evening Post.*

* * * * *

VICTORIA VETERINARY BENEVOLENT FUND

Ladies' Guild

The following additions should be made to the list given under the heading "Donations received during the year" in the report of the Annual Meeting of the V.V.B.F. Ladies' Guild appearing in our issue of November 16th (page 807):—Mrs. Donaldson, 10s.; Mrs. Downie, 10s.; Mrs. Forker, 7s. 6d.; Mrs. Loveless, 8s.; Mrs. McGregor, 17s. 6d.; Mrs. Montgomerie, 7s. 6d.; Mrs. Spreull, 10s.; Mrs. Wishart, 8s. Also, *for* Mrs. Kaz *read* Mrs. Kay.

* * * * *

RATIONING OF ANIMAL FEEDING STUFFS

Relative to Government plans in respect of the above, to which we made preliminary reference in our last issue, the following joint announcement has been issued by the Agricultural Departments and the Ministry of Food.

In order to ensure equitable distribution of the limited supplies of animal feeding stuffs to farmers and others in accordance with the priorities already announced for the various classes of livestock, the Government has decided that the rationing of feeding stuffs, on the lines prepared by a special Committee appointed by the Agricultural Departments of Great Britain, shall be brought into operation at the earliest practicable date, and, if possible, on January 1st, 1941.

The underlying principles of the scheme are briefly as follows:—

(*a*) Rations will be based on the numbers of livestock on each holding and the average yield of milk in each herd.

(*b*) Bulky fodder crops, including grazing, will not be rationed, but each farmer will be expected to produce enough of such crops for the maintenance part of the food requirements of his cattle, sheep and horses.

(*c*) These bulky foods should suffice to produce part of the milk and meat as well as maintenance.

(*d*) Pig and poultry keepers should be allowed only one-third of the quantities of feeding stuffs necessary to maintain, on a full ration, the numbers of pigs and poultry kept before the war.

(*e*) Supplementary rations will be allowed for high yielding dairy herds and other special cases.

(*f*) Cereals and pulses grown and used on the farms will be regarded as part of the rationed feeding stuffs, except the produce of any increased acreage devoted to such crops since the war and dried beet pulp supplied to growers of sugar beet under their contracts.

The local administration of the scheme and in England and Wales the issue of ration coupons will be entrusted to Agricultural Executive Committees. In Scotland coupons will be issued by the Department of Agriculture for Scotland. These Committees have already wide responsibilities in respect of all agricultural holdings exceeding one acre in extent, but there are certain classes of stockowners who have not hitherto come within their purview.

Owners of cattle, sheep, pigs, poultry and goats who have already made an agricultural return during the current year need not take any action at the moment, but owners of stock who have not made an agricultural return should apply at once for registration with their Agricultural Executive Committees, except (*a*) small pig keepers who are members of pig clubs, and (*b*) small poultry keepers who are keeping hens on a domestic scale.

Separate arrangements are being made by the Small Pig Keepers' Council for small pig keepers in England and Wales who are members of pig clubs registered with the Council.

It is expected that arrangements similar to those already existing for members of pig clubs will be made by the Domestic Poultry Keepers' Council for small poultry keepers in England and Wales who are keeping hens on a domestic, as opposed to a commercial, scale with the object of providing eggs for their own use and utilising household and garden waste. It is at present contemplated that the arrangements for the supply of meal under the Domestic Poultry Keepers' Council will be limited to such small poultry keepers who own not more than 50 birds (except on agricultural holdings). Arrangements for domestic poultry keepers in Scotland will be made by the Scottish Gardens and Allotments Committee.

Owners of horses not kept on farms, whether used for transport, riding, etc., will not have to register with Agricultural Executive Committees. Separate arrangements for them will be made by the Ministry of Food.

Anyone who has to apply for registration should send to the Agricultural Executive Committee, whose address in England and Wales is normally in the County town, particulars of the number and quantity of stock in his ownership.

* * * * *

FOOT-AND-MOUTH DISEASE

A further outbreak of foot-and-mouth disease has, since our last issue, been confirmed at Crewkerne, while the existence of the disease has been confirmed among cattle at Swarkestone, near Derby; also at Hunmanby (Yorks), Marnhull (Dorset), and at districts in Herefordshire and Norfolk.

ROYAL SOCIETY MEDALS

One of the two Royal Medals awarded by the Council of the Royal Society for the current year falls to Dr. F. H. A. Marshall, F.R.S., for his contributions to the physiology of animal reproduction.

Among further awards of medals made by the President and Council of the Royal Society is that of the Darwin Medal to Professor J. P. Hill, F.R.S., for his contributions to problems bearing on the interrelationship of the main groups of the Mammalia and on the phylogenetic history of the Primates, a subject with which Charles Darwin himself was so much concerned.

* * * * *

MINISTRY OF AGRICULTURE NEWS SERVICE

Healthy Soil.—A German wireless station recently gave an interesting description, for the benefit of German farmers, of a visit to a dairy farm on sandy soil at Marienhoehe. This farm, apparently, is on extremely poor, sandy soil where the rainfall is only about 15 inches. The cattle are being fed on straw as a substitute for hay and in 1927 the farmer took over the farm with a diseased herd. He believed there was a connection between healthy soil, healthy fodder, healthy cattle and the health of men. He decided to cultivate the land as thoroughly and skilfully as he knew how, and to build up a new herd, bred and born on the farm.

Certainly so far as milk yield is concerned he seems to have been successful. Last year his milk yield under these unpromising conditions averaged just upon 600 gallons per cow, and the milk produced per cultivated acre was 80 per cent. above the average for the district. Thanks to the enhanced nutritional value of his crops brought about by careful cultivation, the farmer saved up to 30 per cent. on the fodder given to his cattle as compared with the standard quantities recommended by the experts.

* * * * *

NEW GUARANTEE FOR FARMERS

Mr. R. S. Hudson, Minister of Agriculture, announced in the House of Commons on Wednesday that the Government had decided to guarantee that the present system of fixed farm prices and an assured market would be maintained for the duration of hostilities and for at least one year after.

CORRESPONDENCE

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

* * * * *

TREATMENT OF STRAINED TENDONS

TO THE EDITOR OF THE VETERINARY RECORD

Sir,—The question should be primarily one of science. At present this is obscured by the demands of owners and trainers and the extravagant importance attached to the winning of races by good horses subsequent to firing. Is it possible that they win in spite of firing?

I am sure Dr. Fraser and Mr. Male will agree that very many horses break down and are fired by light steady hands but do not respond, while well-known thoroughbreds have broken down and recovered to win races without the use of cautery. James MacQueen gives various alternative treatments and opinions on the limited and doubtful value of cautery in Wooldridge's "Encyclopaedia." Captain Hayes in *Veterinary Notes* sheds more light: "Some of the benefit obtained in many instances from firing is undoubtedly due to the absence from severe work which it necessitates."

What actual reparative process is induced or encouraged in cases of tendinitis by a superficial mutilation of the skin, and what does Mr. Male mean by "rousing a strong reaction"? Will he explain further how the strong union of the ruptured fibres is encouraged or obtained without deep penetration of the dermis.

I would suggest to Dr. Fraser that more than discomfort is caused by filled legs and an acute dermatitis; hence the use of cross reins, cradle or pillar reins or even a lad to stand by in case the patient gets really restive.

I have heard of many owners and trainers who would not permit the use of cautery on ethical grounds, and who displayed a sensitiveness as deep as Mr. Hancock's, and a shrewd common sense doubt as to the benefits of firing.

As a great profession we must be able to defend our treatments at least on scientific grounds, but ethical considerations will weigh heavily with our judges and I hope among ourselves.

Yours faithfully,
B. G. Catmur.

The Vineyard,
Abingdon,
Berks.
November 19th, 1940.

* * * * *

MR. FOGGIE'S OBSERVATIONS ON PHENOTHIAZINE

To the Editor of the Veterinary Record

Sir,—May I trespass upon your space for the purpose of explaining an apparent discrepancy between the conclusions arrived at by Mr. Foggie after some trials with phenothiazine (*Veterinary Record* for November 9th) and those of the several workers on this side of the Irish Sea. Mr. Foggie concluded that the dosing of calves was very encouraging but that the results, in his experience, were much less satisfactory in sheep, whereas the experience of the several workers in Great Britain has been uniformly good in the treatment of those animals.

The explanation, as I read it from the protocols of Mr. Foggie's observations, lies in this point, that whereas his experimental cattle were suffering from parasitic gastritis, as indicated by the egg count, his experimental sheep in all probability were not.

My reasons for making this suggestion are to be found in the publication to which Mr. Foggie refers in his paragraph on technique (Taylor, E. L. 1939. *Vet. Rec.* Vol. 51. pp. 895-898), where it is stated that the broad borderline above which an egg count can safely be regarded as representative of disease "may tentatively be fixed for parasitic gastritis in lambs at 2,000 to 6,000 eggs per gram, and for parasitic gastritis in cattle at 300 to 600 eggs per gram." Mr. Foggie's experimental cattle show an egg count well above that level, ranging from 500 to 1,600 e.p.g. with an average of 900 e.p.g., but the egg count in the sheep shows an average of only 444 e.p.g., well below the disease level.

My own observations agree very well with those expressed in the last paragraph of Mr. Foggie's discussion, that the beneficial effect of copper sulphate and nicotine sulphate is very often due to some "tonic" action—possibly the connection of some mineral deficiency. This being so, is it not more than likely that the improvement observed in some of Mr. Foggie's sheep was not the end result of anthelmintic action but was to be referred to this same "tonic effect"?

I would suggest, therefore, that while Mr. Foggie's observations add some very useful data on the value of phenothiazine in cattle, they do not detract in any way from what has previously been written about its value for the treatment of parasitic gastritis in sheep.

Yours faithfully,
E. L. Taylor.

Ministry of Agriculture and Fisheries,
Veterinary Laboratory,
New Haw,
Weybridge,
Surrey.
November 20th, 1940.

A REMARKABLE SURVIVAL

To the Editor of the Veterinary Record

Sir,—I think your readers may be interested in the following unusual case.

One of our Inspectors reports that on the night of September 21st last two land mines were dropped in a provincial town, causing extensive damage. Three weeks later, when debris was being removed, a slight movement was noticed beneath some heavy timber: this was finally moved and a pig was found, still alive. The animal had been pinned down on its side and quite unable to move, and following its rescue was unable to stand owing to stiffness and soreness. After release, it was wrapped in a blanket and fed with warm milk, and has since fully recovered. The age of the pig at the time of the explosion was 10 weeks, and it was in perfect condition, which accounts for its survival after such a prolonged ordeal.

The animal's owner has stated that he will never permit it to be slaughtered—it will be allowed to die of old age!

Yours faithfully,
A. W. Moss,
Assistant Secretary.

Royal Society for the Prevention of Cruelty to Animals,
105, Jermyn Street,
London, S.W.1.
November 19th, 1940.

* * * * *

ROYAL VETERINARY COLLEGE OLD SERVANTS' FUND

To the Editor of the Veterinary Record

Sir,—The fund raised on behalf of the old servants of the Royal Veterinary College has now been distributed and I enclose statement of accounts.

The payments have been made proportionately according to the years of service of the beneficiaries.

Some difficulty was experienced in tracing the beneficiaries and this fact materially delayed closing the accounts. I regret to state that Mr. F. Young was killed by enemy action and under these sad circumstances the sum due to him was paid to his widow.

Yours faithfully,
H. E. Bywater,
Hon. Treasurer.

Town Hall,
West Ham, E.15.
November 18th, 1940.

Royal Veterinary College Old Servants' Fund

Receipts	£	s.	d.
Donations acknowledged in *Veterinary Record* (May 18th, 1940)	44	10	0
H. Purchase, R. Daubney, R. Hudson, S. Piercy	2	0	0
Miss Ford	1	0	0
Miss Holman	1	0	0
Miss Levy	0	10	0
Prof. Miller	1	0	0
Lt.-Col. Greenfield	0	10	0
S. D. Fitt (Librarian)	0	10	6
W. Perryman	0	10	6
	£51	11	0

Disbursements	£	s.	d.
G. Radborn	21	0	0
H. Hitchin	7	2	0
G. Smith	6	13	0
F. Young	6	13	0
S. Sibley	6	3	0
F. Nash	4	0	0
	£51	11	0

Certified to be a correct statement of the accounts of the above fund after an inspection of the cash book and receipts.

J. McCunn.

Larks Hall Farm,
Chingford,
Essex.

Contents

PAGE

GENERAL ARTICLES:

The Antitoxin Content of Commercial Lamb Dysentery Serum
W. T. ROWLANDS and H. H. HARBOUR 843

The Efficacy of Udder Infusion with Entozon as a Treatment for Infection with Group B Streptococci (*Str. agalactiae*)
D. FORSYTH STEWART 845

EDITORIAL:

Veterinary Biological Products 847

CLINICAL COMMUNICATION:

An Unusual Case of Heart Block in a Thoroughbred Gelding
D. T. BARRY and J. A. NICHOLSON 848

ABSTRACTS:

Results of Feeding Zinc to Pregnant Mares and to Mares Nursing Foals (Graham, R., Sampson, J., and Henden, H. R.) ... F. T. D. 850

The Relationship of Parturient Haemoglobinaemia of Dairy Cows to Aphosphorosis (Madsen, D. E., and Nielsen, H. M.) ... L. E. W. B. 850

Iiodine in Animal Nutrition (Fairbanks, B. W., and Curzon, Elizabeth) ... ... D. W. B. T. 851

Development of Cardio-pericardial Adhesions following the Use of Talc (Thompson, S. A.
D. D. O. 851

PAGE

Histology of the Cutaneous Reaction in Guinea-Pigs to Purified Brucella Protein (Morales-Otero, P., Koppisch, E., and Gonzalez, L. M.)
D. D. O. 851

Bee Stings in the Horse (Daake, Dr.) ... C. W. O. 851

Intratrachael Anaesthesia (Gadd, J. D.) W. M. H. 852

REPORT:

National Institute for Research in Dairying: Annual Report (1939) ... ... N. S. B. 852

IN PARLIAMENT:

Government Proposals for Agriculture 852

NOTES AND NEWS:

Movement of Animals 845

Importance of Breeding Stock as a Factor in Ploughing-up Decisions 848

Diseases of Farm Stock: President's Announcement at Shrewsbury 854

R.C.V.S. Obituary 855

R.C.V.S.: Animal Management Examination, November, 1940 855

Ethical Pharmaceutical Association 856

A Clydesdale Centenary 856

Inspection of Casualty Stock 856

Ministry of Agriculture News Service 856

CORRESPONDENCE:

Diseases of Cattle ... GRAHAM REES-MOGG 856

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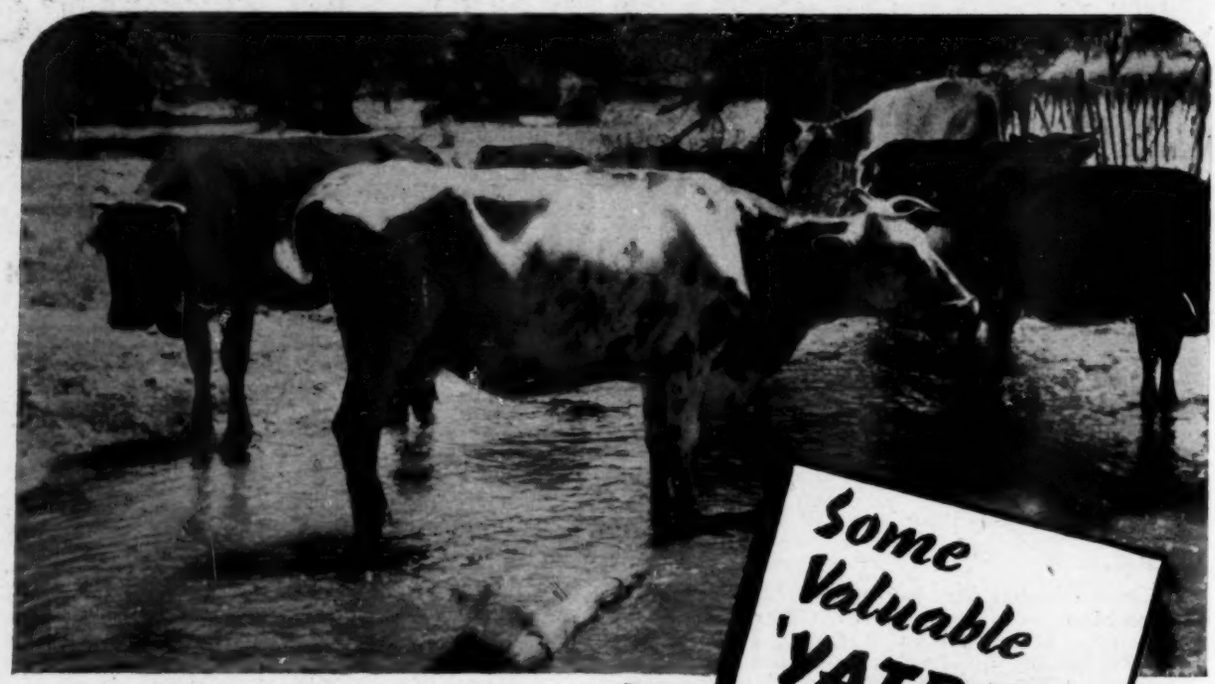

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